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Device and Method for Processing Substrates

The present invention relates to a device and method for processing substrates, in particular, semi-conductor wafers. Devices of this type are well known in the relevant technology. It is also known to supply a processing fluid to a semi-conductor wafer via a plurality of nozzles, whereby all of the nozzles are loaded in the same manner with the treatment or processing fluid.

In this regard, however, the problem exists that the consumption of the treatment fluid is relatively large, since, via all of the nozzles, the same volume of treatment is introduced. With additional, outer-lying nozzles, especially in the peripheral region of a wafer, much processing fluid is thereby consumed in an excessive manner. Moreover, the processes used in these devices are relatively slow.

In Japanese Patent JP-6-73 598A, a device for processing a semi-conductor wafer is disclosed having a first nozzle arranged essentially concentrically to the substrate and three nozzles in addition to the first nozzle, which are separately controllable. With this device, a processing fluid is conducted into a processing tank via nozzles located in the bottom of the processing tank, and fed through a lower electrode, having a grid structure, disposed in the processing tank. A substrate to be plated is retained via an upper electrode 3 above the processing tank and the processing fluid is made to overflow from the processing tank, so that the fluid comes into contact with the retained

substrate. Between the lower and upper electrodes, a current is applied in order to plate the wafer. During processing, the substrate is uniformly contacted over its entire upper surface from below, and on the wafer the flow is returned in an essentially outwardly directed manner. In the outer area of the substrate, the processing fluid therefore only comes into contact with the substrate for a short time. In the edge regions of the processing tank, the processing fluid flows directly from the processing tank, without previously coming into contact with the substrate.

Therefore, the above process requires much processing fluid. The described processing is, in addition, relatively time consuming due to the outwardly directed flow on the upper surface of the wafer.

In Japanese patent JP 5-109 690 A, a device for processing substrates is described with a processing container which is divided into several zones through concentrically arranged inner walls. The respective zones are supplied with fluid via separate lines. A substrate to be treated is retained by means of a substrate carrier over the processing tank and thereby brought into contact with the treatment fluid, so that the treatment fluid is made to overflow from the processing tank.

European patent WO 97-12079 A1 shows further a device for electroplating substrates with a processing tank that, via a single line, is filled from below with processing fluid. The substrate is held above

the processing tank and thereby brought into contact with the processing fluid when the processing fluid is made to overflow the tank. An electrode plate having openings which project at least partially outward is arranged within the processing tank.

The present invention therefore attempts to address the problem of reducing the medium consumption as well as the processing time in treating substrates.

In contrast to the device disclosed in the '598 patent, the problem is resolved with the present invention by providing a first nozzle which directs the liquid onto the substrate in a radial flow, and second nozzles which are directed transverse to the radial flow. In this regard, the radial flow is guided outwardly in a spiral shaped flow. Through the spiral shaped flow, a longer contact time of the fluid with the substrate is achieved, and therefore a smaller consumption of processing fluid. In addition, a higher dynamic of the processing fluid is provided, whereby the processing time can be reduced.

According to a preferred form of the present invention, the first nozzle is a single point nozzle in order to avoid reciprocating action between various nozzles, therefore making possible an especially uniform fluid layer on the substrate.

For a good, controlled alteration of the liquid flow through the first nozzle, the second nozzles form at least one nozzle group which